ANNALS OF SURGERY.

PERFORATING ULCER OF THE STOMACH.[1]

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RECENT medical literature abounds in discussions of the various aspects of the subject of perforating ulcer of the stomach. Among the best articles that have appeared, and which have been carefully studied and extensively made use of in the preparation of this paper, are those by Mikulicz, Lennander, Heinecke, Lindner, and Leube; Gould, Barker, Bidwell, and Mitchell; and in this country Welch, Wier, and Foote; Richardson, Lund, Keen, and Tinker. Many others have done good work in this field, and any paper prepared to-day can but retraverse the ground already so well covered.

History.—In 1880, Mikulicz, while still Billroth's assistant in Vienna, closed by suture a perforation on the lesser curvature of the stomach. The patient died in collapse three hours after the operation. It was not until twelve years later that a successful case, operated upon by Heusner, was reported by Kriege. The first American surgeon to operate upon this condition was Wier in 1891, and the first successful case is reported by Atherton in 1894. From 1880, the date of Mikulicz's first case, up to 1896 but seventy-eight cases were reported.

Tinker, in a very able article upon the subject, reports 232 cases operated on up to 1900; and we are able to add thirty-

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[1] Read before the American Surgical Association, May 1, 1900.

Vol. XXXII, No. 1, July, 1900.

six additional cases, making a total of 268 up to the present time. Of these thirty-six cases, fifteen are taken from Lund's recent tables (Nos. 6, 14, 27, 50, 51, 52, 55, 56, 94, 95, 96; Tables Nos. 2, 15, 32, 34, 40), which are not included in Tinker's list. The other twenty-one are taken from current literature. The results in the 268 cases are: Recoveries 139, deaths 129; a mortality of 48 per cent.; and in the twenty-one most recent cases, thirteen recoveries and eight deaths: a mortality of 38 per cent.

Etiology.—The etiology of perforation is not thoroughly understood. That certain factors are frequently concerned in the production of perforation is admitted, *e.g.*, traumatism, muscular efforts, distention of the stomach with rough and irritating food or drink, etc. Most frequently, however, there is no known determining cause.

Frequency of Occurrence of Perforation.—Perforation is a relatively infrequent sequel of gastric ulcer, occurring in from 6.5 per cent. to 18 per cent. of all cases, according to various statistics. It varies much in different countries and in different localities. Of Tinker's 232 cases, but twenty-two occurred in the United States. Thirty-five cases of gastric ulcer have been treated as such in the wards of the Johns Hopkins Hospital. Perforation has occurred in but a single instance. In this case operation was undertaken by Dr. Bloodgood, but, owing to the desperate condition of the patient, could not be completed.

Perforation takes place relatively more frequently in men than in women, but actually five times more frequently in women; and in the vast majority of cases it occurs in persons in the lower walks of life, particularly young servant girls. It has been observed to be more common in women before the age of thirty, and in men after forty.

Pathological Anatomy.—The fact of greatest surgical importance in the pathological anatomy of perforating gastric ulcer is the presence or absence of adhesions. By their presence and strength they stay the inflammatory process and largely determine its limitations, making possible spontaneous healing, and rendering the exercise of surgical art less urgent and more efficient. Their absence allows the unobstructed progress of the septic elements to the remotest boundaries of the peritoneum. By their agency, largely, localized abscess formation is brought about, or the development of a general peritonitis delayed.

The location of the perforation in the stomach wall determines whether the substance of the pancreas, liver, or spleen will be primarily involved in the inflammatory process. Later, through softening and extension of this process, adjacent structures, as the diaphragm, pleura, pericardium, and abdominal wall, may become involved and perforated, and the pus be discharged into the hollow viscera, transverse colon, duodenum, gall-bladder, heart, lungs, or upon the surface of the body. Fistulæ into these organs are, however, rare; but subphrenic abscess itself is not uncommon, having its origin in a perforated gastric or duodenal ulcer in 20 per cent. of all cases.

If there are no limiting adhesions between the base of the perforating ulcer and the neighboring organs, there is nothing to prevent the extravasation of gastric contents, with the rapid development of a peritonitis, the nature and extent of which are determined by several factors:

(1) *The Site of Perforation.*—From the anatomical relations of the stomach walls and the surrounding structures, it is evident that protecting adhesions are more likely to take place in the case of ulcer on the posterior than on the anterior wall. According to Pariser and Lindner, of 200 cases of gastric ulcer, 190 will be on the posterior wall and ten on the anterior wall; of the 190, four will perforate; of the ten, eight and a half will perforate. While ulcer in general is much more frequent near the pylorus than the cardia, cardiac perforation is relatively about twice as common. Both ulcer and perforation occur more frequently upon the lesser than upon the greater curvature.

(2) Statistics show that in about 20 per cent. of cases there is more than one perforation; there may be several; in rare cases many.

(3) The size of the perforation or perforations is of great importance in determining the amount and rapidity of the extravasation of the gastric contents.

(4) The severity of the resulting peritonitis is influenced largely by the character and amount of the gastric contents. There is always the escape of more or less air from the stomach into the peritoneal cavity; but this is of small moment compared with particles of digested or undigested food in greater or less amount, the marked influence of which solid particles in the production of peritonitis has been known since the work of Grawitz, Halsted, and others. If the perforation occurs while the stomach is empty, the inflammatory process is, as a rule, less intense, and the chances of a favorable outcome are greatly enhanced. The point of greatest intensity of the inflammation is, at first, in the neighborhood of the perforation, and it is here, also, that the recent adhesions form, when present. It is well to bear these two facts in mind while opening the abdomen, since they act as efficient guides to the location of the ulcer.

(5) Of course the main factor in the production of the resulting peritonitis is the number and varieties of bacteria that escape from the stomach into the peritoneal cavity at the time of perforation. The species of bacteria found in the stomach depend, in turn, somewhat upon the nature of the food ingested, but in the stomach, as in the intestine, the flora is more or less constant.

To confine ourselves more particularly to the pyogenic bacteria, with which alone we are now concerned, it is probable, from the observations of Alapy, Hamburger, Kitasato, Macfadyen, Gillespie, and others, that there is no pyogenic organism that may not, under certain circumstances, be present and remain active for some time in the human stomach. They have been found at the height of digestion, and in perfectly empty stomachs. And recent investigations go to show that the stomach is incapable of completely sterilizing itself; that its mucosa is never germ free. The bacilli of tetanus, typhoid fever, and green pus, the colon bacillus and the pyogenic cocci are some of the forms that have been repeatedly found in the healthy stomach. Cushing was able to recover from the jejunal fistula of a patient in the Johns Hopkins Hospital pathogenic bacteria still active, which had been taken into the mouth in inoculated milk. He also demonstrated that " the ingestion of a sterilized diet—the mouth meanwhile being rendered as clean as possible by frequent antiseptic washes—was followed by a pronounced diminution in the number of colonies on plates inoculated from the lumen of the proximal bowel. For forty-eight hours before the operation every precaution was taken to prevent the entrance of micro-organisms through the mouth, and at the time of operation, cultures taken from that part of the bowel above the fistula, where a partial resection was rendered necessary, remained sterile, and no organisms could be demonstrated on stained preparations from the mucosa."

Operators have been singularly remiss in noting the kind of bacteria found in the peritoneal exudate, and but few observations have been recorded in the published cases,—too few to be of any statistical value. The knowledge of the nature of the infectious agent with which we are dealing, from the stand-point of prognosis, is of great importance.

The writers just named have studied carefully the effect of the acid gastric juice upon many varieties of bacteria; and while it is true that many organisms which enter the stomach with the food perish there from its action upon them, still, there are many others that successfully resist, and even remain for a longer or shorter period in the deeper layers of the mucosa after the food has passed out, ready to exert their baleful influence whenever a perforation affords them the opportunity. It is probable that the varying acidity of the gastric fluids in diseased conditions, such as are present in the case of ulcer,—although frequently a hyperacidity is noted in such conditions, —may on the whole rather favor than retard the development of bacteria.

Symptomatology.—That there are no distinctive symptoms indicative of an impending perforation seems assured.

The occurrence of perforation itself, however, is attended, as a rule, by certain well marked phenomena. The most constant and characteristic symptom, perhaps, is sudden, sharp, intense pain in the upper half of the abdomen. This pain, from the intimate relation of the sympathetic nerves with the seventh, eighth, and ninth spinal roots, frequently radiates to the left shoulder. It is accompanied often by vomiting and more or less pronounced symptoms of shock, such as blanched skin, sweating, weak and rapid pulse, shallow respiration, etc. Localized tenderness, gradually extending over the upper part of the abdomen, and marked rigidity, with retraction, of the abdominal muscles, are early noted. Later the retraction of the abdomen gives way to an increasing distention, and hepatic and splenic dulness may disappear. If there has been an escape of any considerable quantity of fluid into the abdominal cavity, fluctuation and movable dulness may be detected. Vomiting is inconstant, appearing in about 40 per cent. of all cases; the vomitus consists usually of the stomach contents and rarely contains blood; as a rule, it occurs but once or twice and then ceases. Peritoneal friction rub, which has been described, is rarely observed.

Another important symptom, to which, hitherto, no attention has been paid in this disease, is the leucocyte count. I first called attention to this point several years ago, in connection with the diagnosis of intestinal perforation in typhoid fever, and what was said in that connection applies with equal force here.

Richard Cabot says "leucocytosis is practically never seen in the course of gastric ulcer except after severe hæmorrhage and at the height of digestion. When patients who have been fed for some time by the rectum alone are first given food by the mouth, the digestion leucocytosis may be marked; in one case it was observed to rise from 4000 to 15,000. After severe hæmorrhage the leucocytosis is only relative, but develops very rapidly. The presence of a leucocytosis, when the influence of bleeding and digestion is excluded, is practically unknown" in uncomplicated gastric ulcer. When, therefore, any or all of the above-mentioned symptoms occür in a young woman giving a history of previous digestive disturbance, however slight, together with the sudden development of a marked leucocytosis, the indications for immediate surgical interference are imperative. Thé real significance of the sudden changes in the number of leucocytes in conditions such as this is as yet unknown; but that it is a diagnostic sign of considerable importance in many cases cannot be questioned; too much reliance, however, should not be placed upon it, as at times it has been wanting, at least at the time of observation.

Diagnosis.—The diagnosis is based upon a previous history of dyspeptic troubles, which history is obtainable in 92 per cent. of all cases; hæmatemesis, etc.; sudden pain in the upper portion of the abdomen, followed quickly by the development of more or less well-marked signs of peritonitis. The condition is to be differentiated from ulcer of duodenum, visceral colics, appendicitis, acute dilatation of the stomach, hæmorrhagic pancreatitis, acute poisonings, uræmia, cancer, intestinal obstruction, pelvic hæmatocele, and cholecystitis. The history of the case will aid largely in making the diagnosis. In the intestinal obstructions the individual coils and peristaltic movements are usually visible and palpable, and borborygmi audible.

Treatment.—The treatment is entirely surgical, for recoveries under an expectant treatment are of the greatest rarity, estimated at 5 per cent. Pariser has collected fourteen and Hall six cases of apparent perforation with recovery, but the diagnosis must be, in such cases, always in doubt.

Surgical Treatment.—If surgical interference has been long delayed, and the infectious process has not been walled off by adhesions, the question then resolves itself into the treatment of a general septic peritonitis, and the same principles that apply to the treatment of this condition elsewhere apply here. Among the first questions that press for answer are,—

(1) Shall we give opium or not? If sure of our diagnosis, we may allow a limited amount of opium, in order to alleviate the suffering of the patient while preparing for the

operation. The general rule holds good in all such cases, however, that the less opium administered, the better the prognosis. I can recall many instances, in my own experience, where the prognosis has been markedly influenced for the worse by the free administration of opium by the attending physician.

(2) Shall we wait until the shock is recovered from? The answer to this question must be in the negative. If the collapse of the patient is so extreme that she is practically moribund, of course no operative procedure would be justifiable; but under ordinary circumstances the sooner the operation is undertaken the sooner the cause for the shock will be removed, and the stimulation of the anæsthetic has often a beneficial effect.

(3) What are the indications for operation? The classical picture as described above, which can be recognized by any one, of course constitutes a definite indication, but in the other less classical, and perhaps more frequently observed, cases, where the symptoms present are urgent and progressively becoming more pronounced, and where there is reason to believe that there is some severe abdominal lesion, it is not certain what, an exploratory incision should be made early, in order to establish a diagnosis. In other words, one should not, in urgent cases. wait for a diagnosis, and thus lose the golden opportunity to relieve the patient, but should operate in order to make a diagnosis. And here we cannot emphasize too strongly the value of cocaine anæsthesia for this purpose. It is strange that this method, which has been used for years in some of the German clinics, notably Mikulicz and Kocher, has gained so little headway in this country. I first suggested its advisability several years ago in exploratory incisions in doubtful cases of typhoid perforation, and have had opportunity to test its value in this as in other conditions. It can be carried out in practically every case, and in very weak patients, with little or no disturbance of the patient, either local or general. and has the additional value of not being followed by post-

anæsthetic sequelæ, as occasionally happens after ether or chloroform.

An incision should be made in the middle line, between the ensiform cartilage and umbilicus, under cocaine or Schleich solution anæsthesia, sufficiently large at first to allow inspection of the interior of the peritoneal cavity and its contents. Through this opening cover-slips and cultures can be taken from the peritoneal fluids for immediate and future examination. If no indication for further operative procedure is found, the exploratory wound can be immediately closed, and no harm has been done and the condition of the patient little, if any, disturbed. If, however, it is found that a peritonitis is present, or an extravasation of gastric contents has taken place, the incision can be immediately enlarged. If the patient complains much, the cocaine may be supplemented by a few whiffs of ether or chloroform. In some instances the operation can be completed under cocaine anæsthesia alone.

As soon as the abdomen is opened, a rapid, systematic, and thorough examination of the stomach should be made. Beginning with the cardiac end, which is more frequently found to be the seat of perforation than the pylorus, one should go carefully over the anterior wall of the stomach to the pylorus, then the lesser curvature, which is more frequently involved than the greater curvature, and, lastly, lift up the stomach and examine the posterior wall. By following this method in the search, examining in order the most likely seats of perforation, one may save much valuable time. Nor should one stop when one has found a single perforation, as in 20 per cent. of cases two or more perforations are found to exist. One can frequently examine fairly well the lesser peritoneal cavity without opening into it, but one should not hesitate to do this in case of doubt. The stomach wall may vary greatly in thickness and consistency. At times, from pyloric obstruction, it may be so hypertrophied and indurated as to be mistaken for carcinoma, as occurred in one of my own cases. If the perforation is very difficult of access, or cannot be found at all, or is surrounded by firm protecting adhesions, it is best to cleanse the peritoneal cavity as thoroughly as possible and drain, either by tube in the ulcer itself, packed about by gauze, or by gauze alone. It is a good rule not to recklessly disturb adhesions which have walled off the general peritoneal cavity, but rather to preserve them. If the perforation is accessible and the stomach walls will permit of suture, the hole should be closed by, preferably, a double row of sutures. The mattress suture of Halsted has, we think, distinct advantages over others. It is unnecessary to excise the ulcer, but where hæmorrhage has been frequent and the patient's condition admits of it, it might be advisable. Where, however, owing to infiltration and stiffness, or great friability of the stomach wall, it is found impossible to suture, one can drain with gauze or tube, as in the case of inaccessible ulcers; or one can plug the opening with a roll of omentum or suture a coil of intestine over the opening, successful instances of which have been reported. It has been recommended, in the case of inaccessible ulcers on the posterior wall, to incise the anterior wall sufficiently to allow access to the perforation. The conditions justifying the use of such procedure, however, will seldom arise. Care should be exercised in suturing ulcers in the neighborhood of either orifice, that no stricture or kink results. This is best avoided by making the line of suture at right angles to the long axis of the stomach.

As to the treatment of general septic peritonitis which is frequently present, if the operation has been delayed, the method of procedure which we advised several years ago in the management of peritonitis following perforating typhoid ulcer we have found most satisfactory.

The steps of the operation are as follows. One or more incisions, free enough to allow an examination of the entire peritoneal cavity, should be made. Through this the intestinal coils are to be withdrawn sufficiently to allow the operator to evacuate any peritoneal exudate, and thoroughly cleanse, with warm salt solution and gauze pledgets, all recesses and folds. The intestinal coils, which should be kept covered, by an assistant, with warm salt sponges or towels during this manœuvre, should then be cleansed as far as possible from exudate and lymph, by irrigation and wiping with pledgets of gauze, and replaced in the abdominal cavity. Too much time should not be consumed in the cleansing, nor should the intestines be handled roughly, thereby producing a certain amount of shock; but it is difficult to exercise too much care in the peritoneal toilet.

The pelvis should never be overlooked, and it may be necessary to make a second incision low down in order to drain it properly. Strips of bismuth or iodoform gauze can be introduced into the pelvis, or about the suture, or in the most dependent portions of the peritoneal cavity for drainage. If the operation has been performed early after the perforation, and the suture has been accomplished satisfactorily, and the peritoneal cavity thoroughly and conscientiously cleansed, we believe it will not be found necessary always to drain by other than the postural method, as suggested by Clarke, particularly if there has not been much extravasation of stomach contents, and if the cover-slips show the absence of streptococci. In case of doubt, however, it is better to drain. If the operation has been performed late, and the bowels are much distended, the injection at the time of operation into the lumen of the intestine of salts, as suggested by McCosh, is advisable, or perhaps the temporary establishment of a jejunal fistula in order to relieve the paralyzed bowel.

For post-operative distention, which will always be more marked in cases where opium has been used freely before operation, calomel in broken doses, followed by salts, high enemata of glycerin and water or glycerin and oil, or turpentine, are to be recommended. The careful washing out of the stomach, while it is only to be used in extreme cases of persisting nausea, may give great relief. The application of the Paquelin cautery to the abdomen is also of advantage.

The patient should be kept upon rectal feeding absolutely for several days, then water or egg albumen in small amounts may be cautiously allowed.

Some of the complications which have been noted are intestinal obstruction from kinking, parotitis, phlebitis, subphrenic abscess, pneumonia, and empyema. These conditions are to be dealt with as the occasion requires. In case, however, of the subsequent development of intestinal obstruction, no delay should be permitted in reopening the abdomen and relieving the obstruction. The contraindication to subsequent operations of this sort is no greater here than in the case of typhoid perforation, where it has been successfully accomplished.

Prognosis.—The prognosis depends largely upon several factors:

(1) The condition of the stomach, whether empty or full, when the perforation takes place.

(2) The interval between the last meal and the perforation.

(3) The time elapsing between the perforation and the operation.

(4) The number and size of perforations.

(5) The position of the patient at the time of perforation.

(6) The perfection of the technique at the operation.

(7) The nature of the infectious agent, whether streptococcus pyogenes or not.

It is probable, as Richardson has pointed out in a recent paper, that the size of the perforation, permitting of a rapid escape of a large amount of stomach contents, is as much a factor in the development of the rapid fulminating forms of peritonitis as the character of the organism itself; as he expresses it, "a sudden overwhelming of the abdominal cavity rather than a spreading invasion."

In the cases reported by Pariser and Hall, in which recovery without operation has taken place after supposed perforation, the perforation invariably occurred in an empty stomach. It has been urged by some that the position of the patient, whether sitting or erect, or in the horizontal position, exercised considerable effect upon the amount of extravasation at the moment of perforation. A study of the fatal cases shows that the cause of death in the majority of instances was sepsis, either from the subsequent development of a local subphrenic abscess or from the immediate results of the peritonitis, so that too much stress cannot be laid upon the care and detail with which this part of the operation is carried out. A study of the successful cases brings out the fact that in a considerable proportion of them, particularly in those cases operated upon late, there developed, subsequent to the suture, a certain amount of suppuration either in the abdominal wall or in the deeper tissues. This has not seemed, however, to affect materially the ultimate result. While, on the other hand, of those cases operated upon early, before twelve hours, Tinker particularly emphasizes the fact that, in the past three years, 83.78 per cent. have recovered. Granted that this percentage may be, perhaps, too high, it is still most encouraging in its great and continuous increase over the doubtful 5 per cent. that recover without surgical aid.

TABLE OF CASES OF PERFORATING ULCER OF THE STOMACH SUBMITTED TO OPERATION NOT INCLUDED IN THE TABLES OF PREVIOUS WRITERS.

No. 1.—*Operator,* Mitchell. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Male, aged twenty-five years. *Site of perforation,* anterior surface of pylorus. *Time,* sixty hours. *Result,* died in twenty-four hours. *Remarks,* irrigation; second ulcer near cardia.

No. 2.—*Operator,* Mitchell. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Female, aged twenty-eight years. *Site of perforation,* anterior surface near lesser curvature. *Time,* four hours. *Result,* died in eighteen hours. *Remarks,* partial excision; irrigation.

No. 3.—*Operator,* Browne (Walter). *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Female, aged nineteen years. *Site of perforation,* anterior surface near cardia. *Time,* three hours. *Result,* recovered. *Remarks,* irrigation; drainage; abscess of anterior wall; No. 6 of Tinker's list.

No. 4.—*Operator,* Mitchell. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Female, aged twenty-one years. *Site of perforation,* anterior surface near lesser curvature and near cardia. *Time,* twenty-four hours. *Result,* died in twenty-eight hours. *Remarks,* irrigation; drained.

No. 5.—*Operator,* Sinclair. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Male, aged forty-five years. *Site of per-*

foration, anterior surface near pylorus. *Time,* three and one-half hours. *Result,* died in twelve hours.

No. 6.—*Operator,* Wheeler. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Male, aged forty years. *Site of perforation,* anterior surface near lesser curvature. *Time,* eighteen hours. *Result,* died on tenth day. *Remarks,* douched; drained; death from intestinal obstruction due to adhesion.

No. 7.—*Operator,* Sinclair. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Female, aged nineteen years. *Site of perforation,* anterior surface near cardia. *Time,* twenty-seven hours. *Result,* recovered. *Remarks,* sponged; drained.

No. 8.—*Operator,* Mitchell. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Female, aged thirty-two years. *Site of perforation,* anterior surface near lesser curvature and three inches from pylorus. *Time,* eight and one-half hours. *Result,* recovered. *Remarks,* sponged; drained.

No. 9.—*Operator,* Campbell (Robert). *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Male, aged thirty years. *Site of perforation,* anterior surface close to pylorus near lesser curvature. *Time,* twenty-six and one-half hours. *Result,* died. *Remarks,* douched with boiled water; drained.

No. 10.—*Operator,* Campbell (John). *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Female, aged thirty-two years. *Site of perforation,* anterior surface close to lesser curvature and midway between pylorus and cardia. *Time,* six and one-half hours. *Result,* recovered. *Remarks,* sponged; douched; drained.

No. 11.—*Operator,* Mitchell. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Female, aged twenty-two years. *Site of perforation,* anterior surface near lesser curvature and cardia. *Time,* eight hours. *Result,* recovered. *Remarks,* sponged; drained.

No. 12.—*Operator,* Sinclair. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Male, aged twenty-seven years. *Site of perforation,* anterior surface near lesser curvature and two-thirds of an inch from cardia. *Time,* eleven and one-half hours. *Result,* died on twenty-second day. *Remarks,* sponged; douched; drained; at autopsy right and left subphrenic abscess; left pleural abscess; pericarditis.

No. 13.—*Operator,* Mitchell. *Reference,* British Medical Journal, March 10, 1900, Vol. i, p. 568. Female, aged twenty years. *Site of perforation,* anterior surface near pylorus. *Time,* five hours. *Result,* recovered. *Remarks,* sutured; sponged; drained.

No. 14.—*Operator,* Griffiths. *Reference,* British Medical Journal, 1900, Vol. i, p. 573. Male, aged nineteen years. *Site of perforation,* anterior wall close to pylorus. *Time,* twelve hours (?). *Result,* recovered. *Remarks,* irrigated; sponged; closed.

No. 15.—*Operator,* Griffiths. *Reference,* British Medical Journal, 1900, Vol. i, p. 573. Male, aged twenty-seven years. *Site of perforation,* anterior wall near pylorus. *Time,* twenty-four hours. *Result,* recovered. *Remarks,* tuck of stomach to close perforation; douched; closed.

No. 16.—*Operator,* McCosh. *Reference,* Medical News, May, 1896, Vol. lxviii, p. 486. Female, aged thirty years. *Site of perforation,* lesser curvature. *Result,* recovered. *Remarks,* sutured opening; good recovery; slowly increasing epigastric pain for five or six weeks before operation.

No. 17.—*Operator,* Eve. *Reference,* London Lancet, January 25, 1900, Vol. i, p. 155. Female, aged thirty-eight years. *Site of perforation,* posterior wall near lesser curvature *one and a half to two inches from* cardia. *Time,* eight hours. *Result,* recovered. *Remarks,* abdomen washed *out and drained; healed by first intention.*

No. 18.—*Operator,* Robson. *Reference,* British Medical Journal. March 10, 1900, Vol. i, p. 674. Female. *Result,* recovered. *Remarks,* abdomen cleansed and closed; good recovery.

No. 19.—*Operator,* Huntingdon. *Reference,* ANNALS OF SURGERY, April, 1900, p. 458. Male, aged forty-two years. *Site of perforation,* anterior wall two inches from pylorus. *Time,* fourteen hours. *Result,* recovered. *Remarks,* operated first for appendicitis; removed appendix, then irrigated and sutured.

No. 20.—*Operator,* Richardson. *Reference,* Philadelphia Medical Journal, February 3, 1900, Vol. i, p. 272. Male, aged twenty-two years. *Site of perforation,* anterior wall three inches from pylorus. *Time,* (?). *Result,* recovered. *Remarks,* sponged; irrigated; drained.

No. 21.—*Operator,* Richardson. *Reference,* Philadelphia Medical Journal, February 3, 1900, Vol. i, p. 272. Female, aged twenty-seven years. *Site of perforation,* anterior wall at junction of upper and middle third of transverse and longitudinal axes. *Time,* forty-eight hours. *Result,* died on eleventh day. *Remarks,* irrigated; drainage-tube in stomach; death from second ulcer on posterior wall.

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